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09/697,703	10/27/2000	Michael G. Taylor	301	4821

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EXAMINER	
BELLO, AGUSTIN	
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2633	9

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 09/697,703	**Applicant(s)** TAYLOR, MICHAEL G.	
	Examiner Agustin Bello	**Art Unit** 2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 August 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 8 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-4, 9, 12-16, 19, and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bulow (U.S. Patent No. 5,793,511) in view of Cao (U.S. Patent No. 6,130,766).

Regarding Claims 1 and 19, Bulow teaches a polarization mode dispersion compensating apparatus, comprising: a polarization mode dispersion compensator (reference numeral 1.7 in Figure 1) optically coupled to an input port and receiving an input optical signal having polarization mode dispersion (column 1 lines 9-10), said polarization mode dispersion compensator having a variable polarization mode dispersion (e.g. polarization controller 1.7 of Figure 1 variably changes the polarization of the input signals); a polarimeter (reference numeral 1.4, 1.5, 1.8, 1.9, 1.2 in Figure 1) optically coupled to the output of said polarization mode dispersion compensator and outputting an electrical signal (reference numeral 1.16, 1.17 in Figure 1) representing polarization states of the optical signal; and a controller (reference numeral 1.3 in Figure 1) operatively coupled to said polarimeter and said polarization mode compensator, said controller receiving the electrical signal from said polarimeter (reference numeral 1.2 in Figure 1) ; said controller controlling said polarization mode dispersion compensator according to the electrical signal to compensate for the polarization mode

dispersion of the input optical signal (column 3 lines 17-28). Bulow differs from the claimed invention in that Bulow fails to specifically teach that the input optical signal has a wavelength dither. However, dithering of an optical signal is very well known in the art. Cao, in the same field of endeavor, teaches that wavelength dithering of an input signal is very well known in the art (column 5 lines 22-44). One skilled in the art would have been motivated to dither the wavelength of an input signal in order to generate an electrical dithering output control signal to a laser. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to have dithered the wavelength of an input signal.

Regarding Claim 2, the combination of Bulow and Cao teaches or suggests the polarization mode dispersion compensating apparatus according to claim 1, further comprising; a signal source (reference numeral 32 in Figure 1 of Cao) for generating the input optical signal with the wavelength dither, wherein the input optical signal is transmitted across optical fiber (reference numeral 1.18 in Figure 1 of Bulow) and/or components that cause the input signal to have the polarization mode dispersion.

Regarding Claims 3 and 12-14, Bulow teaches said polarimeter including: a first polarizer (reference numeral A1 in Figure 6) optically coupled to said polarization mode dispersion compensator (reference numeral 6.1 in Figure 6), said first polarizer plane polarizing an optical signal output from said polarization mode dispersion compensator at first polarization angle (column 5 lines 40-43); a second polarizer (reference numeral A2 in Figure 6) optically coupled to said polarization mode dispersion compensator, said second polarizer plane polarizing an optical signal output from said polarization mode dispersion compensator at a second angle different than the first angle (column 5 lines 40-43); a third polarizer (reference numeral An in

Figure 6) optically coupled to said polarization mode dispersion compensator; a first photodetector (reference numeral D1 in Figure 5) optically coupled to said first polarizer and outputting a first detection signal (reference numeral I1 in Figure 5); a second photodetector (reference numeral D2 in Figure 5) optically coupled to said second polarizer and outputting a second detection signal (reference numeral I2 in Figure 5); and a third photodetector (reference numeral DN in Figure 5) optically coupled to said third polarizer and outputting a third detection signal (reference numeral IN in Figure 5). Bulow differs from the claimed invention in that Bulow fails to specifically teach that said third polarizer circularly polarizing an optical signal output from said polarization mode dispersion compensator. However, being that Bulow teaches that each of the polarizers produces signals with different polarizations (column 5 lines 40-43), one skilled in the art would clearly have recognized that circular polarization could have been included. Circular polarization of a signal is very well known in the art. One skilled in the art would have been motivated to have circularly polarized the optical signal output by the polarization mode dispersion compensator via the third polarizer taught by Bulow in order to have anticipated the polarization mode dispersion for circularly polarized signals. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to have circularly polarized the optical signal output by the polarization mode dispersion compensator via the third polarizer taught by Bulow.

Regarding Claims 4 and 15, Bulow teaches that said controller controls said polarization mode dispersion compensator so as to minimize a sum of the squares of the first, second and third detection signals to compensate for the polarization mode dispersion of the input optical signal (e.g. minimizing method, column 3 line 66 – column 4 line 7).

Regarding Claims 9 and 16, the combination of Bulow and Cao differs from the claimed invention in that it fails to specifically teach that said controller utilizes an adaptive learning algorithm to further minimize the sum of the squares of the first, second and third detection signals and further compensate for the polarization mode dispersion of the input optical signal. However, such learning algorithms are well known in the art. One skilled in the art would have been motivated used a learning algorithm in order to consistently and precisely reduce the polarization mode dispersion of the input signals. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to have used a controller with an adaptive learning algorithm

Regarding claims 21-23, Bulow teaches that the polarimeter detects polarization states of the output of the polarization mode dispersion compensator in at least three degrees of freedom (as indicated by the use of three different splitters A1-AN in Figure 5).

3. Claims 5-9, 17, 18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bulow in view of Cao and Fishman (U.S. Patent No. 5,930,414).

Regarding Claims 5, 17, and 20, the combination of Bulow and Cao teaches a polarization controller (reference numeral 1.7 in Figure 1 of Bulow) optically coupled to the input port and receiving the input optical signal, but differs from the claimed invention in that it fails to specifically teach a first birefringent component optically coupled to said polarization controller; a variable retarder optically coupled to said first birefringent component; and a second birefringent component optically coupled to said variable retarder; said controller operatively coupled to said polarimeter, said variable retarder and said polarization controller; said controller controlling said variable retarder and said polarization controller according to the electrical

signal to compensate for the polarization mode dispersion of the input signal. However, Bulow teaches an integrated version of the claimed invention wherein a birefringent element and a variable retarder within the polarization controller are controlled by a controller according to an electrical signal to compensate for the polarization mode dispersion of the input signal, the controller being coupled to the variable retarder, the polarization controller, and the polarimeter (column 3 lines 13-34). Furthermore, Fishman, in the same field of endeavor, teaches a first birefringent component (reference numeral 435 in Figure 4) optically coupled to said polarization controller (reference numeral 430 in Figure 4); a variable retarder (reference numeral 440 in Figure 4) optically coupled to said first birefringent component; and a second birefringent component (reference numeral 445 in Figure 4) optically coupled to said variable retarder; said controller (reference numeral 470 in Figure 4) operatively coupled to said polarimeter (reference numeral 455 in Figure 4), said variable retarder and said polarization controller; said controller controlling said variable retarder and said polarization controller according to the electrical signal to compensate for the polarization mode dispersion of the input signal (abstract). Clearly, the teachings of Bulow, Cao, and Fishman would have suggested to one skilled in the art that either an integrated version (taught by Bulow) or a modular version (taught by Fishman) could have been used as the polarization mode compensator. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to have used the modular structure of the polarization mode dispersion compensator taught by Fishman in the device of the combination of Bulow and Cao.

Regarding Claim 6, the combination of Bulow, Cao, and Fishman teach or suggest a first polarizer (reference numeral A1 in Figure 6 of Bulow) optically coupled to said second

birefringent component (reference numeral 445 in Figure 4 of Fishman), said first polarizer plane polarizing an optical signal output from said second birefringent component at an angle parallel to an optic axis (e.g. polarization selected by one skilled in the art for the polarizer taught by Bulow in Figure 6) ; a second polarizer (reference numeral A2 in Figure 6 of Bulow) optically coupled to said second birefringent component, said second polarizer plane polarizing an optical signal output from said second birefringent component at an angle not parallel to the optic axis (e.g. polarization selected by one skilled in the art for the polarizer taught by Bulow in Figure 6); a third polarizer (reference numeral AN in Figure 6 of Bulow) optically coupled to said second birefringent component, said third polarizer plane circularly polarizing an optical signal output from said second birefringent component (e.g. polarization selected by one skilled in the art for the polarizer taught by Bulow in Figure 6); a first photodetector (reference numeral D1 in Figure 5 of Bulow) optically coupled to said first polarizer and outputting a first detection signal; a second photodetector (reference numeral D2 in Figure 6 of Bulow) optically coupled to said second polarizer and outputting a second detection signal; and a third photodetector (reference numeral DN in Figure 6 of Bulow) optically coupled to said third polarizer and outputting a third detection signal.

Regarding Claims 7 and 18, the combination of Bulow, Cao, and Fishman teaches or suggests that said controller controls said polarization mode dispersion compensator so as to minimize a sum of the squares of the first, second and third detection signals to compensate for the polarization mode dispersion of the input optical signal (e.g. minimizing method, column 3 line 66 – column 4 line 7 of Bulow).

Regarding Claim 8, Bulow teaches that said polarization controller and said retarder are integrated electrooptic waveguide devices or liquid crystal components (column 3 lines 22-34).

4. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bulow in view of Cao and Bergano (U.S. Patent No. 6,134,033).

Regarding Claim 10, the combination of Bulow and Cao differs from the claimed invention in that it fails to specifically teach a plurality of optical transmitters, each emitting a corresponding one of a plurality of optical signals, each of the plurality of optical signals being at a respective one of a plurality of wavelengths and having a respective wavelength dither; an optical combiner having a plurality of inputs, each of which being coupled to a respective one of said plurality of optical transmitters, and an output supplying the plurality of optical signals to a first end portion of an optical communication path; an optical demultiplexer having an input configured to be coupled to a second end portion of the optical communication path, and a plurality of outputs, each of the plurality of outputs of said optical demultiplexer supplying a respective one of the plurality of optical signals; a plurality of polarization mode dispersion compensating apparatuses according to claim 1, each of which being coupled to a respective one of the plurality of outputs of said optical demultiplexer; a plurality of optical receivers, each of which being coupled to a respective one of the plurality of outputs of said polarization mode compensating apparatuses. However, multiplexing a plurality of signals via an optical combiner, transmitting the combined optical wavelengths via fibers and amplifiers to a receiving end, the receiving end comprising a demultiplexer and dispersion compensators, is very well known in the art. Bergano teaches such a multiplexed communication system including dispersion compensation at the receiver. One skilled in the art would clearly have recognized that it would

have been possible to use the polarization mode compensators taught by the combination of Bulow and Cao as the dispersion compensators in the multiplex communication device of Bergano. Furthermore, Bulow suggests using the polarization mode dispersion compensators in a transmitter and receiver system (column 1 lines 10-15, column 2 lines 4-19). One skilled in the art would have been motivated to use the compensators of the combination of Bulow and Cao in the device of Bergano in order to have the ability to compensate for polarization mode dispersion. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to have used the compensators taught by the combination of Bulow and Cao as the dispersion compensators taught by Bergano.

Regarding Claim 11, the combination of references teach or suggest a plurality of optical amplification devices arranged in series along the optical communication path (column 4 lines 61-64 of Bergano).

Response to Arguments

5. Applicant's arguments filed 8/12/03 have been fully considered but they are not persuasive. The applicant argues that the combination of Bulow and Cao fails to specifically teach all the limitations of the claimed invention. However, the examiner disagrees. In particular, the applicant argues that the combination of references fails to specifically teach the newly added limitation wherein the polarimeter is optically coupled to the output of the polarization mode dispersion compensator. However, as seen in Figure 1 of Bulow, the polarimeter (reference numeral 1.4, 1.5, 1.8, 1.9, 1.2 in Figure 1) is clearly optically coupled to the polarization mode dispersion compensator via splitter 1.6. Applicant's observation that signal D output from the equalization circuit is not used as a feedback is correct, however the

examiner does not rely on output D to meet the limitations of the claimed invention. Instead, the examiner relies on Bulow's teaching that output 1.15 is used for feedback control, therefore meeting the limitations of the claimed invention.

The applicant's notation that the claim 19 recites a "Q" detector is appreciated. However, Bulow inherently teaches that a "Q-detector" is coupled to the polarization mode dispersion compensator in that equalizing circuit 1.2 outputs a signal 1.15 representing the quality signal "Q" produced therein. Therefore, Bulow meets the limitations of claim 19.

6. In response to applicant's argument that teachings of Cao can not be combined with the teachings of Bulow, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Agustin Bello whose telephone number is (703)308-1393. The examiner can normally be reached on M-F 8:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (703)305-4729. The fax phone numbers for the organization where this application or proceeding is assigned are (703)872-9314 for regular communications and (703)872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)305-3900.

AB
October 31, 2003

JASON CHAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600